DODI 3222.3 and Army System HEMP Survivability: An Update

By Mr. Robert A. Pfeffer

Note. *A previous article entitled "DODI 3222.3 and Army System HEMP Survivability" was published in the* Combating WMD Journal *in 2007.*[1] *Since then, several Department of Defense (DOD) initiatives have delayed the planned release of Department of Defense Instruction (DODI) 3222.3. This article provides an update and explains the status of DODI 3222.3.*

Background

The conflicts of the 21st Century have resulted in a significant change in the way the U.S. Army thinks and fights. The threat has changed and, with it, the structure of the Army. The emphasis is no longer on an all-out nuclear exchange with another superpower. Instead, the most recent conflicts have involved less sophisticated enemies who use more conventional (nonnuclear) methods of warfare. Therefore, near-term future conflicts are expected to be less decisive and possibly longer-lasting than more traditional conflicts.

The strategic advantage of using new technology to apply the "shock and awe" effect on large groups of adversaries has also diminished. New technology is now more likely to be used to respond to small concentrations of adversaries who themselves use new technology on an extended battlefield. The most probable adversarial use of new technology is the use of commercial, off-the-shelf (COTS) electronics to communicate and to detonate conventional munitions or relatively unsophisticated chemical, biological, radiological, and nuclear weapons.

One common thread between the Cold War and conflicts of the 21st century is the ever-increasing reliance on new technologies to improve the Army fighting capability and remain a force multiplier. The most dramatic technological revolution has been the simultaneous improvement and continued miniaturization of semiconductor devices. Subsystems have physically shrunk at the same time their capabilities have improved. Unfortunately, this improvement is also available to adversaries; cell phones are one example.

COTS electronics and electrical equipment provide the most advanced technology available for commercial and military applications. However, there are potential pitfalls to the military use of just any COTS materiel solution. The life expectancy of equipment in relatively benign commercial environments is four years or less. However, the military expectation is that the equipment last for a longer period of time in harsher battlefield environments, including environments of extreme heat or cold as well as severe electromagnetic environments, such as those with a high-altitude electromagnetic pulse (HEMP). Therefore, DOD has directed additional requirements on all electronic and electrical systems that support critical missions. One of these requirements is that systems operating in a wide range of electromagnetic environments be protected from associated electromagnetic environmental effects (E3). Directions were outlined in a series of documents known as Department of Defense directives (DODDs) and DODIs.

DODDs and DODIs

The Constitution of the United States establishes the framework for our government. The legislative branch writes legislation, and the executive branch signs or otherwise allows

this legislation to become public law. At the top of the directive pyramid is the President, who issues classified or unclassified presidential directives or executive orders that explicitly identify executive priorities on national issues. For issues that include military equipment or facility protection, DOD first develops policy (directives) and then implementation guidance (instructions). DODDs are the formal DOD means of providing broad policy guidance on specific issues of concern to the Secretary of Defense and the President. DODDs contain a statement of the issue, and they identify the responsibilities of the Office of the Secretary of Defense and subordinate organizations. Policy implementation guidance is then provided in associated DODIs. DODDs and DODIs are categorized into the following eight major subject groups:

- 1000: Manpower and Personnel (Civilian, Military, and Reserve).
- 2000: International and Foreign Affairs.
- 3000: Plans and Operations, Research and Development, Intelligence, and Computer Language.
- 4000: Logistics, Natural Resources, and Environment.
- 5000: Acquisition, Administrative Management, Organizational Charters, Security, Public Affairs, and Legislative Affairs.
- 6000: Health.
- 7000: Budget, Finance, Audits, and Information Control.
- 8000: Information Management/Information Technology.

The nuclear weapons effects (NWE) community is familiar with the 5000 series. DODD 5000.01 states that "Acquisition managers shall provide U.S. Forces with systems and families of systems that are secure, reliable, interoperable, compatible with the electromagnetic spectrum environment, and able to communicate across a universal information technology infrastructure, including NSS [national security systems], consisting of data, information, processes, organizational interactions, skills, analytical expertise, other systems, networks, and information exchange capabilities."[2] To implement DODD 5000.01, the joint staff prepared Chairman of the Joint Chiefs of Staff Instruction (CJCSI) 3170.01F.[3] Following this guidance, each Service prepared its own implementing documents in the form of regulations. The Army's implementing regulation for NWE (including HEMP) survivability is Army Regulation (AR) 70-75.[4]

DODD 3222.3

On 8 September 2004, the previous version of DODD 3222.3 (10 August 1990) was reissued ". . . to update policy and responsibilities for the management and implementation of the DOD Electromagnetic Environmental Effects (E3) Program to ensure mutual electromagnetic compatibility (EMC) and effective E3 control among ground, air, sea, and space-based electronic and electrical systems, subsystems, and equipment, and with the existing natural and man-made electromagnetic environment (EME)."[5]

The directive explicitly outlines the following five-part policy:[6]

- All electrical and electronic systems, subsystems, and equipment, including ordnance containing electrically initiated devices, shall be mutually compatible in their intended EME without causing or suffering unacceptable mission degradation due to E3.
- Military E3 specifications, standards, and handbooks stressing interface and verification requirements, establishing operational performance, and specifying developmental and operational test methodologies shall be developed following guidance outlined in DOD 4120.24-M.[7]
- Analytical tools and databases for EMC analysis and E3 assessment shall be developed and maintained to predict, prevent, and correct E3 deficiencies of military systems in the intended operational EME.
- DOD shall maintain measurement capability to quantify E3 of military systems to and from their intended operational EME.
- E3 awareness and training shall be promulgated throughout DOD.

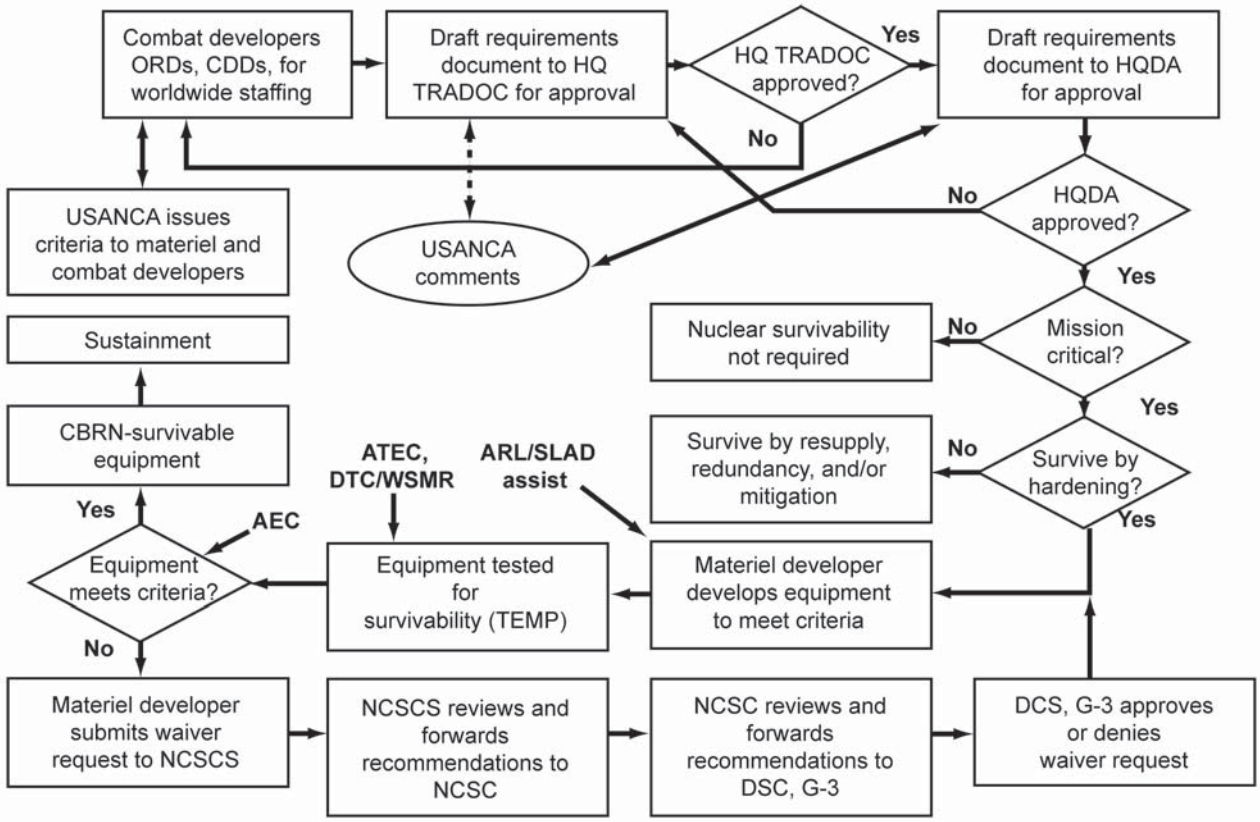
DODI 3222.3

Originally scheduled for completion in 2006, DODI 3222.3 was intended to support DODD 3222.3 by outlining the directive implementation process. The release of the instruction was later postponed until 2007. However, in the meantime, two new initiatives affected the publication of DODI 3222.3. First, a policy memo from former Deputy Secretary of Defense Gordon England stipulated that future DODDs and DODIs would be combined into one document referred to as a DODI. Thus, the existing DODD 3222.3 would be cancelled once the DODI 3222.3 draft was revised to include DODD 3222.3, resulting in the new DODI 3222.3. On 20 May 2009, it was announced that the new DODI 3222.3 was complete, in the approval process, and expected to be signed and released as early as 2009. In addition, DODD 5134.08, which addresses combating weapons of mass destruction protection of military systems, was released on 14 January 2009.[8]

Army HEMP Survivability

Since the 1960s, the Army has exercised an NWE survivability program that includes the survivability of HEMP. The success of the initial program was due, in part, to the audit trail used to monitor the progress of new systems that supported critical missions.

In reestablishing the 2004 Electromagnetic Pulse Commission, Congress reiterated its concern for homeland security by raising the issue of HEMP protection of our national assets—especially those that support critical missions. That concern, coupled with the implementation and enforcement of DODD 3222.3, has resulted in a renewed emphasis on HEMP



Legend:

ARL	U.S. Army Research Laboratory
ATEC	U.S. Army Test and Evaluation Command
CBRN	chemical, biological, radiological, and nuclear
CDD	capability development document
DCS	deputy chief of staff
DTC	U.S. Army Developmental Test Command
G-3	assistant chief of staff for operations and plans
HQ	headquarters
HQDA	Headquarters, Department of the Army
NCSC	Nuclear and Chemical Survivability Committee
NCSCS	Nuclear and Chemical Survivability Committee Secretariat
ORD	operational requirements document
SLAD	Survivability and Lethality Analysis Directorate
TEMP	test and evaluation master plan
TRADOC	U.S. Army Training and Doctrine Command
USANCA	U.S. Army Nuclear and Combating Weapons of Mass Destruction Agency
WSMR	White Sands Missile Range

Typical nuclear/HEMP survivability program flow diagram

protection of critical Service acquisitions. Because HEMP survivability is now an operational requirement—[9]

- DOD will enforce E3 protection through the DODD and DODI processes.
- E3 (including HEMP) protection cannot be traded away.
- E3 protection must be applied to manned and unmanned platforms and systems that prevent personnel from entering harm's way.

New Army acquisitions that must meet the NWE survivability requirement through hardware protection must, at a minimum, survive the HEMP environment specified in Military Standard (MIL-STD) 2169B.[10] Historically, this requirement has not played a major role in driving the cost of new Army systems. A survey of several legacy equipment acquisition programs shows that they met the NWE survivability requirement for less than three percent of the total cost of the system; HEMP hardening costs accounted for about one percent. The modest cost results in very few requests for HEMP criteria waivers. According to U.S. Army Nuclear and Combating Weapons of Mass Destruction Agency records, only one system—the Intermediate Forward Test Equipment—has been granted a HEMP criteria waiver.

Future Impact to Army and Other Service Acquisition Programs

If properly enforced, DODD 3222.3 and the new DODI 3222.3 would further strengthen existing NWE survivability documentation. According to DODD 3222.3, the HEMP survivability requirement must be met by all military electronic and electrical systems—not just those that support critical missions. Thus, E3 protection from such EMEs as HEMP, high-powered microwaves, and electrostatic discharge is no longer just a survivability requirement—it is now an operational requirement; therefore, it is no longer available as a trade-off for materiel developers.

By addressing E3 protection in a single directive, DODD 3222.3 encourages system designers to design all E3 protection at the same time, thus sharing and ultimately reducing E3 protection costs. This philosophy is consistent with the unified E3 protection approach discussed in Quadripartite Standardization Agreement (QSTAG) 1051.[11]

Conclusion

DODD 3222.3, which is the first DODD to specifically address EMC and E3 control of all electronic and electrical systems, places an operational requirement on E3 (including HEMP) protection. It could have a significant technical and monetary impact on future Army equipment acquisitions. However, the new DODI 3222.3 remains in final draft with no scheduled release date.

Endnotes:

[1]Robert A. Pfeffer and John L. Carter, "DODI 3222.3 and Army System HEMP Survivability," *Combating WMD Journal*, Issue 1, Spring/Summer 2007.

[2]DODD 5000.01, *The Defense Acquisition System*, 12 May 2003.

[3]CJCSI 3170.01F, *Joint Capabilities Integration and Development System*, 1 May 2007.

[4]AR 70-75, *Survivability of Army Personnel and Materiel*, 2 May 2005.

[5]DOD Issuances (Official Department of Defense Web Site for DOD Issuances), <*http://www.dtic.mil/whs/directives/corres/dir.html*> (DODD 3222.3: *DOD Electromagnetic Environmental Effects [E3] Program*), accessed on 17 September 2009.

[6]DODD 3222.3, *DOD Electromagnetic Environmental Effects (E3) Program*, 8 September 2004.

[7]DOD 4120.24-M, *DOD Standardization Program (DSP) Policies and Procedures*, 9 March 2000.

[8]DODD 5134.08, *Assistant to the Secretary of Defense for Nuclear and Chemical and Biological Defense Programs (ATSD [NCB])*, 14 January 2009.

[9]Ibid.

[10]MIL-STD 2169B, *High Altitude Electromagnetic Pulse (HEMP) Environment*, December 1993.

[11]QSTAG 1051, Edition 1, *A Unified Approach to Electromagnetic Protection*, 6 October 1998.

Reference:

Robert A. Pfeffer, "Reducing Army EM Protection Costs: A New Look at an Old Problem," *NBC Report*, Fall/Winter 1999.

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